

CURRICULUM VITAE

Freya Kamel

Education

June 1969	BA (Mathematics), Brandeis University, Waltham, MA
June 1978	PhD (Biological Sciences), State University of New York, Binghamton, NY
Aug 1991	MPH (Epidemiology), University of North Carolina, Chapel Hill, NC

Employment

1970-1972	Research Assistant, Microbial Genetics, Biology Department, Tufts University, Medford, MA
1972-1978	Research Assistant, Reproductive Endocrinology, Department of Biological Sciences, State University of New York, Binghamton, NY
1978-1981	Postdoctoral Fellow, Laboratory for Neuroendocrinology, The Rockefeller University, New York, NY
1981-1982	Assistant Professor, Laboratory for Neuroendocrinology, The Rockefeller University, New York, NY
1983-1989	Assistant Professor, Department of Physiology, University of Wisconsin, Madison, WI
1989-1998	Staff Fellow, Epidemiology Branch, National Institute of Environmental Health Sciences, Research Triangle Park, NC
1998-present	Staff Scientist, Epidemiology Branch and National Toxicology Program, National Institute of Environmental Health Sciences, Research Triangle Park, NC

Research Interests

Neurologic dysfunction and disease, occupational and environmental health, community-based research, public health policy

Societies

International Society of Environmental Epidemiology, Society for Epidemiologic Research, Society of Toxicology

Professional Service

Epidemiology Liaison, National Toxicology Program (NTP)

Member, Report on Carcinogens Review Group I, NTP Nominations Committee, Committee on Promotions II, DIR Scientific Review Committee

Member, Search Committees for Tenure-Track Scientist, Laboratory of Neurobiology; NTP Study Scientist; NTP Biostatistician; NTP Report on Carcinogens Staff Scientist (chair)

Journals: Associate Editor, Environmental Health Perspectives (2005); Editorial Board, American Journal of Epidemiology (2005),

Manuscript reviewer: for Epidemiology, Annals of Epidemiology, Occupational and Environmental Medicine, Environmental Research, Endocrinology, Biology of Reproduction, American Journal of Physiology

Ad hoc referee for NSF, Michael J. Fox Foundation for Parkinson's Research

Symposia, Workshops, Review Groups, and Expert Panels

Organizer and Rapporteur, Exposure Assessment in Occupational and Environmental Epidemiology Breakout Group, *The Role of Human Exposure Assessment in the Prevention of Environmental Disease*, Aug, 1999.

Rapporteur, Neurodegenerative Disease Breakout Group, *Epidemiology in the 21st Century*, Nov, 1999.

Participant, Michael J. Fox Foundation for Parkinson's Research strategic workshop on *Environmental Influences on Parkinson's Disease*, Dec 13, 2001.

Participant, ALS Association workshop on *Environmental Factors and Susceptibility Genes in ALS*, May 30 – Jun 1, 2002.

Participant, ATSDR Expert Panels on *Surveillance of Alzheimer's and Parkinson's Disease* (Sep 18, 2002) and *Surveillance of Multiple Sclerosis and Amyotrophic Lateral Sclerosis* (Sep 19, 2002).

Participant, NIEHS roundtable discussions on *Research Needs and Opportunities in ALS* (Nov 1, 2002 and May 28, 2003).

Co-organizer (with William Boyes, US EPA), Symposium for the Society of Toxicology Annual Meeting, *Pesticide Neurotoxicity in Adults: Integrating Contributions from Epidemiology and Toxicology*, March 6-10, 2005.

Awards

NIH Merit Award for accomplishments as a member of the NIEHS/NIH Review Committee for the Report on Carcinogens, 2000.

Publications

1. Siegel, E.C., and **Kamel, F.** Reversion of frameshift mutations by mutator genes in *Escherichia coli*. *J. Bacteriol.*, 117:994-1001, 1974.
2. Frankel, A.I., Mock, E.J., Wright, W.W., and **Kamel, F.** Characterization and physiological validation of a radioimmunoassay for plasma testosterone in the male rat. *Steroids*, 25:73-98, 1975.
3. Mock, E.J., **Kamel, F.**, Wright, W.W., and Frankel, A.I. Plasma testosterone in vasectomized rats. *J. Reprod. Fertil.*, 44:575-578, 1975.
4. Mock, E.J., **Kamel, F.**, Wright, W.W., and Frankel, A.I. A seasonal rhythm in plasma testosterone and luteinizing hormone of the male laboratory rat. *Nature*, 256:61-63, 1975.
5. **Kamel, F.**, Mock, E.J., Wright, W.W., and Frankel, A.I. Alterations in plasma concentrations of testosterone, LH, and prolactin associated with mating in the male rat. *Horm. Behav.*, 6:277-288, 1975.
6. **Kamel, F.**, Wright, W.W., Mock, E.J., and Frankel, A.I. The influence of mating and related stimuli on plasma levels of LH, FSH, prolactin, and testosterone in the male rat. *Endocrinology*, 101:421-429, 1977.
7. **Kamel, F.**, and Frankel, A.I. Hormone release during mating in the male rat: Time course, relation to sexual behavior, and interaction with handling procedures. *Endocrinology*, 103:2172-2179, 1978.
8. **Kamel, F.**, and Frankel, A.I. The effect of medial preoptic area lesions on sexually-stimulated hormone release in the male rat. *Horm. Behav.*, 10:10-21, 1978.
9. **Kamel, F.**, and Frankel, A.I. Testosterone is necessary for sexually-stimulated luteinizing hormone and prolactin release in the male rat. *Endocrinology*, 104:1461-1466, 1979.
10. Krey, L.C., **Kamel, F.**, and McEwen, B.S. Parameters of neuroendocrine aromatization and estrogen receptor occupation in the male rat. *Brain Res.*, 193:277-283, 1980.

Publications (continued)

11. Jellinck, P.H., Krey, L.C., Davis, P.G., **Kamel, F.**, Luine, V.N., Parsons, B., Roy, E.J., and McEwen, B.S.: Central and peripheral action of estradiol and catecholestrogens administered at low concentration by constant infusion. *Endocrinology*, 108:1848-1854, 1981.
12. **Kamel, F.**, and Krey, L.C. Gonadal steroid modulation of LHRH-stimulated LH secretion by pituitary cell cultures. *Mol. Cell. Endocrinol.*, 26:151-164, 1982.
13. **Kamel, F.**, and Krey, L.C. Intracellular receptors mediate gonadal steroid modulation of LHRH-induced LH release. *Mol. Cell. Endocrinol.*, 28:471-486, 1982.
14. Krey, L.C., and **Kamel, F.** Aromatization: Important for testosterone's developmental influences on the neurocircuits mediating cervically-stimulated prolactin secretion in the female rat. *Brain Res.*, 274:188-192, 1983.
15. **Kamel, F.**, and Krey, L.C. Gonadal steroid modulation of LH secretion stimulated by LHRH, Ca²⁺, and cAMP. *Mol. Cell. Endocrinol.*, 32:285-300, 1983.
16. Biegon, A., Parsons, B., Krey, L.C., **Kamel, F.**, and McEwen, BS. Behavioral and neuroendocrine effects of long-term progesterone treatment in the rat. *Neuroendocrinology*, 37:332-335, 1983.
17. Mann, D.R., Evans, D., Edoimioya, F., **Kamel, F.**, and Butterstein, G.M.: A detailed examination of the in vivo and in vitro effects of ACTH on gonadotrophin secretion in the adult rat. *Neuroendocrinology*, 40:297-302, 1985.
18. **Kamel, F.**, Balz, J.A., Kubajak, C.L., and Schneider, V.A. Effects of LHRH pulse amplitude and frequency on LH secretion by perfused rat anterior pituitary cells. *Endocrinology*, 120:1644-1650, 1987.
19. **Kamel, F.**, Balz, J.A., Kubajak, C.L., and Schneider, V.A. Gonadal steroid modulation of LH secretion by perfused rat anterior pituitary cells. *Endocrinology*, 120: 1651-1657, 1987.
20. **Kamel, F.**, and Kubajak, C.L. Modulation of gonadotrophin secretion by corticosterone: Interaction with gonadal steroids and mechanism of action. *Endocrinology*, 121:561-568, 1987.
21. **Kamel, F.**, and Kubajak, C.L. Gonadal steroid effects on the LH response to arachidonic acid and protein kinase C. *Amer. J. Physiol.*, 255:E314-E321, 1988.
22. Dumesic, D.A., Renk, M.G., and **Kamel, F.** Estrogenic effects of phenol red on rat pituitary cell responsiveness to gonadotropin-releasing hormone. *Life Sci.*, 44:397-406, 1988.

Publications (continued)

23. Krey, L.C., and **Kamel, F.** Progesterone modulation of gonadotropin secretion by dispersed rat pituitary cells in culture. I. Basal and gonadotropin-releasing hormone-stimulated luteinizing hormone release. *Mol. Cell. Endocrinol.*, 68:85-94, 1990.
24. Krey, L.C., **Kamel, F.**, and Maclusky, N.J. Progesterone modulation of gonadotropin secretion by dispersed rat pituitary cells in culture. II. Intracellular metabolism and progestin receptors. *Mol. Cell. Endocrinol.*, 68:95-103, 1990.
25. Krey, L.C., and **Kamel, F.** Progesterone modulation of gonadotropin secretion by dispersed rat pituitary cells in culture. III. A23187, cAMP, phorbol ester and DiC8-stimulated luteinizing hormone release. *Mol. Cell. Endocrinol.*, 70:21-9, 1990.
26. Dumesic, D.A., Pohl, H., **Kamel, F.**, and Terasawa, E. Increase in luteinizing hormone content occurs in cultured human fetal pituitary cells exposed to gonadotropin-releasing hormone. *J. Clin. Endocrinol. Metab.*, 70:606-14, 1990.
27. Bookstaff, R.C., **Kamel, F.**, Moore, R.W., Bjerke, D.L., and Peterson, R.E. Altered regulation of pituitary gonadotropin-releasing hormone (GnRH) receptor number and pituitary responsiveness to GnRH in 2,3,7,8-tetrachlorodibenzo-*p*-dioxin-treated male rats. *Toxicol. Appl. Pharmacol.* 105(1):78-92, 1990.
28. Krey, L.C., and **Kamel, F.** Estradiol processing by pituitary cells in culture: An examination of the influences of various exposures to progesterone. *Life Sci.*, 47:1235-1241, 1990.
29. Hinshelwood, M.M., **Kamel, F.**, Dierschke, D.J. and Hauser, E.R. Effects of charcoal--extracted follicular fluid on reproductive function in postpartum cows: II. pituitary function in vitro. *Domes. Anim. Endocrinol.* 8(1):37-54, 1991.
30. **Kamel, F.**, and Krey, L.C. Testosterone processing by pituitary cells in culture: An examination of the role of 5 α -reduction in androgen action on the gonadroph. *Steroids*, 56:22-29, 1991.
31. Alavanja MCR, Akland G, Baird DD, Blair A, Bond A, Dosemici M, **Kamel F**, et al. Cancer and noncancer risk to women in agriculture and pest control: The Agricultural Health Study. *J Occup Med*, 36:1247-50, 1994.
32. Cooper GS, **Kamel F**, Sandler DP, Davey FR, and Bloomfield CD. Risk of adult acute leukemia in relation to prior immune-related conditions. *Canc Epidemiol Biomark Prev* 5:867-872, 1996.
33. Baird DD, Wilcox AJ, Weinberg CR, **Kamel F**, McConnaughey DR, Musey PI, and Collins DC. Preimplantation hormonal differences between the conception and non-conception cycles of 32 normal women. *Human Reprod* 12:2607-13, 1997.

Publications (continued)

34. Gladen BC, Sandler DP, Zahm SH, **Kamel F**, Rowland AS, and Alavanja MCR. Exposure opportunities of families of farmer pesticide applicators, *Am J Ind Med* 34:581-7, 1998.
35. Baird DD, Weinberg CR, Zhou H, **Kamel F**, McConnaughey DR, Kesne, JW, and Wilcox AJ. Preimplantation urinary hormone profiles and the probability of conception in healthy women. *Fertil Steril* 1999; 71:40-9.
36. **Kamel F**, Umbach DM, Munsat TL, Shefner JM, and Sandler DP. Association of cigarette smoking with amyotrophic lateral sclerosis, *Neuroepidemiology* 1999; 18:194-202.
37. Longnecker MP, **Kamel F**, Umbach DM, Munsat TL, Shefner JM, Lansdell LW, and Sandler DP. Dietary intake of calcium, magnesium, and antioxidants in relation to risk of amyotrophic lateral sclerosis. *Neuroepidemiology* 2000; 19:210-216.
38. **Kamel F**, Boyes WK, Gladen BC, Rowland AS, Alavanja MCR, Blair A, and Sandler DP. Retinal degeneration in licensed pesticide applicators. *Am J Ind Med* 2000; 37:618-28.
39. **Kamel F**, Moreno T, Rowland AS, Stallone L, Ramirez-Garnica G, and Sandler DP. Recruiting a community sample in collaboration with farmworkers. *Envir Health Perspect* 2001; 109:supplement 3:457-9.
40. **Kamel F**, Umbach DM, Munsat TL, Shefner JM, Hu H, and Sandler DP. Lead exposure and amyotrophic lateral sclerosis. *Epidemiology* 2002; 13:311-9.
41. **Kamel F**, Umbach DM, Lehman TA, Park LP, Munsat TL, Shefner JM, Sandler DP, Hu H, Taylor JA. ALS, lead, and genetic susceptibility: δ -aminolevulinic acid dehydratase and vitamin D receptor genes. *Environ Health Perspect* 2003; 111:1335-9.
42. **Kamel F**, Rowland AS, Park LP, Anger WK, Baird DD, Gladen BC, Moreno T, Stallone L, Sandler DP. Neurobehavioral performance and work experience in Florida farmworkers. *Environ Health Perspect* 2003; 111:1765-72.
43. Alavanja MCR, Hoppin JA, **Kamel F**. Health effects of chronic pesticide exposure: Cancer and Neurotoxicity. *Annu Rev Publ Health* 2004; 25:155-197.
44. **Kamel F**, Hoppin JA. Association of pesticide exposure with neurologic dysfunction and disease. *Environ Health Perspect* 2004; 112:950-958.

Publications (continued)

45. Blair A, Sandler D, Thomas K, Hoppin JA, **Kamel F**, Coble J, Lee WJ, Rusiecki J, Knott C, Dosemeci M, Lynch CF, Lubin J, Alavanja M. Disease and injury among participants in the Agricultural Health Study. *J Agricul Safety Health* 2005; 11:141-150.
46. Terry PD, **Kamel F**, Umbach DM, Lehman TA, Hu H, Sandler DP, Taylor JA. VEGF promoter haplotype and amyotrophic lateral sclerosis (ALS). *J Neurogenet* 2005; 18:429-34.
47. Blair A, Sandler DP, Tarone R, Lubin J, Thomas K, Hoppin JA, Samanic C, Coble J, **Kamel F**, Knott C, Dosemeci M, Zahm SH, Lynch CF, Rothman N, Alavanja MCR. Mortality among participants in the Agricultural Health Study. *Ann Epidemiol* 2005; 15:279-285.
48. Kirrane EF, Hoppin JA, **Kamel F**, Umbach DM, Boyes WK, DeRoos A, Alavanja M, Sandler DP. Retinal degeneration and other eye disorders in wives of farmer pesticide applicators enrolled in the Agricultural Health Study. *Amer J Epidemiol* 2005; 161:1020-1029.
49. **Kamel F**, Engel LS, Gladen BC, Hoppin JA, Alavanja MCR, Sandler DP. Neurologic symptoms in licensed private pesticide applicators in the Agricultural Health Study. *Environ Health Perspect* 2005; 113: 877-882.
50. **Kamel F**, Umbach DM, Hu H, Munsat TL, Shefner JM, Taylor JA, Sander DP. Lead Exposure as a Risk Factor for Amyotrophic Lateral Sclerosis (ALS). *Neurodegenerative Diseases* 2005; in press.
51. **Kamel F**, Engel LS, Gladen BC, Hoppin JA, Alavanja MCR, Sandler DP. Neurologic symptoms in licensed pesticide applicators in the Agricultural Health Study. *Human and Experimental Toxicology*. submitted.
52. Wilcox AJ, **Kamel F**, Bell D. Collaborators in the midst of confusion: Misunderstanding epidemiology in the language of laboratory science. submitted.
53. **Kamel F**, Tanner CM, Umbach DM, Hoppin JA, Alavanja MCR, Blair A, Comyns K, Goldman SM, Korell M, Ross GW, Langston JW, and Sandler DP. Parkinson's disease and pesticide exposure in the Agricultural Health Study. In preparation.
54. **Kamel F**, Rowland AS, Park LP, Anger WK, Baird DD, Gladen BC, Hudnell K, Moreno T, Stallone L, Sandler DP. Workplace quality, pesticide exposure, and neurobehavioral performance in Florida farmworkers. In preparation.

Invited Talks

Environmental Neurotoxicants as Risk Factors for ALS. Medical College of Wisconsin, 1994.

Pesticides and Neurologic Function in Farmworkers. NIOSH, 1997.

Lead Exposure and Amyotrophic Lateral Sclerosis. NIEHS, 1998.

Retinal Degeneration in Licensed Pesticide Applicators. US-EPA, 1999.

Pesticides and Parkinson's Disease: The Agricultural Health Study. International Society of Environmental Epidemiology, 2000.

Kamel F, Moreno T, Rowland AS, Stallone L, Ramirez-Garnica G, and Sandler DP. Recruiting a community sample in collaboration with farmworkers. American Public Health Association, 2000.

Report on Carcinogens: Use of Human Epidemiologic Findings. NY Academy of Sciences Conference on Carcinogenesis Bioassays and Protecting the Public Health, 2002.

Lead Exposure and Amyotrophic Lateral Sclerosis. ALS Association Conference on Environmental Factors and Susceptibility Genes in ALS, 2002.

Lead Exposure and Amyotrophic Lateral Sclerosis. The Parkinson's Institute, 2003.

Neurotoxicity of Chronic Pesticide Exposure in Licensed Pesticide Applicators in the Agricultural Health Study (AHS). Society of Toxicology, March 2005.

Lead Exposure and Amyotrophic Lateral Sclerosis. ALS: Beyond the Motor Neuron, Punta del Este, Uruguay, March 2005.

Neurotoxicity of Chronic Pesticide Exposure in Licensed Pesticide Applicators in the Agricultural Health Study (AHS). International Neurotoxicology Association, Porvoo, Finland, June 2005.

Conference Presentations

1. Kamel, F., and Frankel, A.I. Effects of sexual behavior on plasma concentrations of testosterone and LH in the male rat. Proceedings of the Society for the Study of Reproduction, 1974.
2. Kamel, F., and Frankel, A.I. Effect of sexual stimuli on LH, prolactin, and testosterone in the male rat. Proceedings of the Society for the Study of Reproduction, 1976.
3. Kamel, F., and Frankel, A.I. Time course of LH, prolactin, and testosterone release during mating in the male rat: correlation with mating behavior. Proceedings of the Endocrine Society, 1977.
4. Kamel, F., and Frankel, A.I. Testosterone is necessary to LH and prolactin release during mating in the male rat. Proceedings of the Endocrine Society, 1978.
5. Kamel, F., and Krey, L.C. Androgen receptors mediate the inhibition of LH secretion by testosterone. Proceedings of the Society for the Study of Reproduction, 1980.
6. Krey, L.C., and Kamel, F. Cervically-stimulated prolactin release in the female rat: modulation by neonatal steroid treatment. Proceedings of the Society for Neuroscience, 1980.
7. Kamel, F., and Krey, L.C. Genomic mechanism of gonadal steroid effects of LHRH-stimulated LH secretion. Proceedings of the Endocrine Society, 1981.
8. Kamel, F., and Krey, L.C. Gonadal steroid modulation of LH secretion stimulated by LHRH, K⁺, Ca²⁺, and cAMP. Proceedings of the Endocrine Society, 1982.
9. Krey, L.C., Kamel, F., and Chervu, A. Mechanisms underlying progesterone modulation of LHRH-induced LH secretion in vitro. Proceedings of the Endocrine Society, 1982.
10. Kamel, F., and Krey, L.C. The role of metabolism in steroid modulation of LH secretion. Proceedings of the Endocrine Society, 1983.
11. Edoimioya, F., Kamel, F. and Mann, D.R. In vitro evidence that adrenocorticotropin does not directly alter gonadotropin secretion at the pituitary level. Proceedings of the Endocrine Society, 1983.
12. Kamel, F., and Kubajak, C.L. Cooperative effects of phorbol esters and arachidonic acid on LH secretion: Modulation by gonadal steroids. Proceedings of the Endocrine Society, 1986.
13. Kamel, F., and Kubajak, C.L. Inhibition of LH secretion by corticosterone: Interaction with gonadal steroids. Proceedings of Society for the Study of Reproduction, 1986.

Conference Presentations (continued)

14. Hinshelwood, M.M., Kamel, K., Dierschke, D.J., and Hauser, E.R. The effect of in vivo administration of follicular fluid on the in vitro release of luteinizing hormone (LH) and follicle-stimulating hormone (FSH) from cultured pituitary cells. Proceedings of the Society of Dairy Science, 1986.
15. Dumesic, D.A., Kamel, F., and Jaffe, R.B. Estradiol (E2) sensitization of cultured human fetal pituitary cells to gonadotropin releasing hormone (GnRH): a post-GnRH receptor phenomenon. Proceedings of the Society for Gynecologic Investigation, 1988.
16. Hinshelwood, M.M., Renk, M.G.H., Kamel, F., Dierschke, D.J., and Hauser, E.R. Effect of bovine follicular fluid injections during the luteal phase on reproduction in heifers. Proceedings of the Society of Animal Science, 1988.
17. Hinshelwood, M.M., Kamel, F., Dierschke, D.J., and Hauser, E.R. Effects of injection of bovine follicular fluid in heifers on pituitary function in vitro. Proceedings of the Society for the Study of Reproduction, 1988.
18. Bookstaff, R.C., Kamel, F., Moore, R.W., and Peterson, R.E. 2,3,7,8-tetrachloro-dibenzo-*p*-dioxin decreases pituitary responsiveness to gonadotropin-releasing hormone (GnRH) in male rats. Proceedings of the Society of Toxicology, 1989.
19. Dumesic, D.A., Kamel, F., and Terasawa, E. Cultured human fetal pituitary cells metabolize gonadotropin-releasing hormone to enhance cellular LH content. Proceedings of the Endocrine Society, 1989.
20. Kamel, F., Baird, D.D., Umbach, D.M., and Green, A.M. Metabolic, dietary, and reproductive determinants of sex hormone binding globulin (SHBG) levels in postmenopausal women, Proceedings of the Society for Epidemiologic Research, 1996.
21. Kamel, F., Umbach, D.M., Hu, H., Munsat, T.L., Shefner, J.M., and Sandler, D.P. Lead exposure and amyotrophic lateral sclerosis (ALS). *Am J Epidemiol* 1998; 147:S75.
22. Kamel, F., Boyes, W.K., Gladen, B.C., Rowland, A.S., Alavanja, M.C.R., Blair, A., Mage, D.T., and Sandler, D.P. Retinal degeneration (RD) and pesticide use. *Epidemiology* 1998; 9 (4 suppl):S23.
23. Kamel F, Moreno T, Rowland AS, Stallone L, Ramírez-Garnica G, and Sandler DP. Community participation and response rates in a study of farmworkers. *Epidemiology* 1998; 9 (4 suppl):S117.
24. Kamel F, Boyes WK, Gladen BC, Blair A, Alavanja MCR, and Sandler DP. Visual dysfunction and pesticide use. *Epidemiology* 1999; 10 (4 suppl):S123.

Conference Presentations (continued)

25. Kamel, F, Tanner DM, Hoppin JA, Umbach DM, Goldman SM, Aston DA, Ross, GW, Alavanja MCR, Blair A, Langston JW, and Sandler DP. Pilot study of Parkinson's disease (PD) in the Agricultural Health Study (AHS). Nineteenth International Toxicology Conference, Colorado Springs, CO, Aug 25-28, 2001.
26. Kamel F, Rowland AS, Anger WK, Baird DD, Gladen BC, Moreno T, Park LP, Stallone L, Sandler DP. Neurobehavioral performance and work experience in Florida farmworkers. *Epidemiology* 2002; 13 (4 suppl): S138.
27. Blair A, Sandler D, Thomas K, Hoppin J, Kamel F, Lee WJ, Rusiecki J, Lubin J, Knott C, Dosemici M, Lynch CF, Alavanja MCR. Disease and injury among participants in the Agricultural Health Study.
28. Kamel F, Engel LS, Gladen BC, Hoppin JA, Alavanja MCR, Sandler DP. Neurologic symptoms in licensed pesticide applicators in the Agricultural Health Study. *Epidemiology* 2004; 15: S181.
29. Umbach D, Kamel F. Combining information from multiple studies to improve inference about genetic and environmental risks. *Epidemiology* 2004; 15:S140.